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Nonlinear optical sensors on metal nanoparticles synthesized by ion implantation

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Abstract

Recent results on ion synthesis and nonlinear optical properties of metal nanoparticles in various dielectrics are presented. Copper and silver nanoparticles were fabricated in silica and soda lime glasses by low energy ion implantation. The nonlinear optical characteristics of nanoparticle composite materials, which may be suited for optical sensing, were studied by applying Z-scan transmittance measurements. They were performed in the near IR area at a wavelength of 1,064 nm, using picosecond pulses of a Nd:YAG laser. Optical nonlinearities of the metal nanoparticles in various substrates such as a nonlinear refraction and a nonlinear susceptibility were detected. It was shown that the influence of the dielectric environment (optical constants) around these nanoparticles considerably changes the nonlinear optical response of the composite materials. Ultrafast optical sensors based on nonlinear effects in metal nanoparticles are discussed. © 2011 Springer Science+Business Media B.V.

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Keywords

Ion implantation, Metal nanoparticles, Nanoparticles sensor, Optical-nonlinear absorption